A comprehensive approach to improving MRI Services

Philips Healthcare Transformation Services and Tufts Medical Center collaborate to enable performance improvement in Magnetic Resonance Imaging (MRI)
Introduction

Background: Tufts Medical Center

Tufts Medical Center in Boston, MA is an internationally-respected academic medical center and teaching hospital. It is the principal teaching hospital for Tufts University School of Medicine, conducts groundbreaking medical and health policy research, and is among the top 15% of independent institutions to receive federal research funding. Recently, Tufts Medical Center (Tufts MC) received a number of awards for their exceptional patient care, innovative research, and leading staff education programs.

The Tufts MC MRI Services Department is part of the Radiology Department. It includes three stationary MRI units and one mobile MRI unit which perform approximately 15,000 adult and pediatric MRI procedures annually. For our project, these units were referenced as MRI #1, MRI #2, MRI #3, and Mobile Unit according to system location.

MRI patient volume had been steady with a slight increase in volume from the prior year. Market research indicated continued growth in outpatient MRI services for the patient community in the future. The Tufts MC team had some capacity to support growth but was looking to further improve workflow, system utilization, and patient throughput while maximizing MRI utilization. They were also considering technology upgrades to simultaneously support their financial goals and improve MR imaging quality.

A collaborative, phased approach

Tufts MC MRI Services turned to Philips Healthcare Transformation Services as an industry leader and trusted partner to help them leverage performance improvement best practices and innovative methodologies in order to streamline their workflow processes and reduce examination delays and operational inefficiencies. The goals were to increase patient throughput, evaluate various technology upgrade options, and support the continual delivery of exceptional patient care.

The consulting team recommended a collaborative, phased approach, working with a Tufts MC-Philips project team. The project proposal included data collection and analysis; onsite collaboration, observations, interviews, and further data collection; and development of root cause and effect with prioritized recommendations.

The Tufts MC Director of Radiology agreed with the approach and appreciated the holistic and collaborative nature of the project recommendation.

1. (Tufts Medical Center).
2. (The Advisory Board Company, 2014).
A holistic approach to MRI improvement and growth

The Philips consultants took a holistic approach to current-state assessment of the MRI services (see Figure 1) beginning with a detailed analysis of the MRI workflow. This process included various analyses (procedure time analysis, schedule gap analysis, etc.) to characterize the existing operations and identify potential gaps in performance. Next, they evaluated the potential for technology enablement which included upgrading the current analog MRI units to digital platforms, assessing the potential removal of the mobile unit, and the related workflow impact of these potential changes. Finally, they looked at market drivers and future demand in an effort to reduce market leakage and capture additional future market share.

MRI Workflow Optimization

- **Workflow**
  - Appropriate block time with staff alignment
  - Pull vs push
  - Streamlined and accurate scheduling
  - Patient prep, etc.

- **Technology**
  - Upgraded MRI capabilities and digital platforms
  - IT related enhancements
  - Visual controls, dashboard/reporting mechanisms

- **Market**
  - Referral management (retention and growth)
  - Design experience and technology

**Figure 1: Philips approach to MRI performance improvement.**

Project deliverables

A Philips-Tufts MC project team was established including Philips consultants and Tufts MC MRI clinical and management staff. The first action was to agree to the project deliverables which included:

- Analysis of current state: operations and trends
- Observations and anonymized interviews of key stakeholders
- Analysis of possible root causes by process area (i.e. fishbone, affinity)
- Simulation of current-state: patient flow, workflow process maps, and assumptions
- Future-state simulation outputs (process diagram and results from multiple scenarios)
- Cost-benefit and ROI calculation for MRI technology upgrades
- Prioritized change recommendations and evaluation criteria
- Outline of key implementation activities with high-level timeline
Operational workflow

As with all Philips consulting engagements, this project began with a request to collect key data so the consultants could create a detailed workflow analysis. Data sources included department floor plans, system utilization reports, scheduling protocols and appointment details, and process delay information as well as patient demographics including patient type, volume, and sources.

Benchmark data related to MRI exams and protocols was also gathered and reviewed to enable the consultants to propose performance improvement initiatives which would impact the workflow, technology, clinical staff, and related processes. As part of the data analysis, schedule gap (see Figure 2) and scheduled time to arrival time analyses (see Figure 3) were conducted to review the current capacity of the MRI units and scheduling capacities respectively.

Once the data analysis was well underway, the consultants began the stakeholder input phase. During the on-site visits, they interviewed 25+ key stakeholders such as radiologists, anesthesiologists, nurses, technologists, schedulers, management staff, and others. They focused the interviews on comprehensively gathering insights and perspectives. In addition to these interviews, they observed live operations and relevant processes to fully understand the current state and identify root causes for inefficiencies. The Tufts MC stakeholders provided thorough comments and feedback and they were eager to work with the Philips team to find solutions to improve the MRI operations and overall patient experience.

During the interviews, the Tufts MC staff advised that they had implemented some leading practices to help streamline workflow such as:
- Sending appointment reminders to patients
- 72-hour advanced schedule reviews
- Tracking every “next 3rd” appointment
- MRI information sheets, distributed to patients
- Inpatients triaged by radiologists, to reduce add-on patient load
- Flexible music options for adults to reduce stress
- Comfort Talk® training for staff to reduce patient and family anxiety and stress

The MRI department outpatient flow was observed and charted, including 11 steps which could be the cause of potential time delays (See Figure 4).

The Philips consultants identified several improvement opportunities. They tested the hypotheses and revised the recommendations based on testing results. The change recommendations were prioritized to align with the project goals and were reviewed with the Tufts MC team leaders to obtain feedback and discuss any concerns.
Project recommendations focused on mitigating delays while improving patient throughput and the overall patient experience. Change initiatives were directed at improving efficiency of the MRI patient flow, reducing exam times with streamlined processes, and eliminating wasted effort in terms of scheduling, protocol reviews, transportation, check-in, triage/prep, and the exam itself (including patient prep/screening, scan times, changing over times, etc.).

New systematic processes were recommended with slight variations for inpatient and outpatient procedures. The new recommendations focused on reducing the total time from patient arrival to exam completion. Other change considerations included patient environment alterations, new team communication tools and procedures, and other change management programs to further reduce associated staff burden.

The project change recommendations included:
- Further evaluate, document, and reduce incomplete patient preparation
- Assess constraints of scheduling tools, exam protocols, and schedule times
- Implement an integrated patient ‘pull’ process that pulls rather than pushes a patient to the MRI room from upstream triage and check-in processes based on availability, demand and patient tracking system (see Figure 5)
- Conduct ‘daily huddles’ with radiologists, technologists, and receptionists to confirm schedules and review accuracy of exam protocols
- Conduct physical redesign and environmental improvements in transition areas along with improvements in patient/family way-finding
- Develop Radiology Information System (RIS) and Hospital Information System (HIS) enhancements and training programs
- Implement operational dashboard that would support real-time and periodic sampling of key performance data
- Upgrade the stationary MRI systems from analog to digital platform (Philips dStream® technology was recommended)

In addition, the Philips-Tufts MC project team gathered and confirmed key assumptions in order to populate a pro-forma tool which helped estimate possible return on investment (ROI) scenarios for upgrading the three stationary MRI units.

Figure 5: Integrated patient “pull” process.
MRI technology enablement

Tufts MC asked Philips to provide a data-based evaluation of the potential technology enablement options such as upgrading the current analog MR units to a digital platform and/or removing the mobile unit. They were looking to better understand the related workflow impact to these potential changes.

Comprehensive return on investment (ROI) and net present value analyses were performed including a ROI analysis for each individual MR system with a detailed list of assumptions and variables of the 3 stationary MR units. The data from these analyses supported the earlier recommendation to upgrade the 3 stationary MR systems from an analog platform to a digital platform. A prioritized timeframe recommendation was included, demonstrating the expected increased ROI.

Philips dStream was recommended to upgrade the three stationary MRIs to a digital platform as it delivers several advantages over the existing analog platform including:

- Fully-digital coils that boost image quality
- Improved patient throughput of up to 30%
- Reduced exam time by enabling imaging with fewer, lighter coils and fast patient set-up
- Expandability with channel independence to expand the coil family without channel conflicts and the need to upgrade RF receive channels
- Quick installation and minimal disruption with no magnet removal

![Figure 6](image)

Market demographics and referral management

With an understanding of the operational and technology changes required to streamline and improve the MRI workflow, the project focus moved onto the MRI services market needs, growing demand, and referral management.

Over 80% of Tufts MC MRI volume comes from outpatient referrals, making it a significant population to understand and manage. From the MRI market analysis, it was determined that the demand for MRI exams within a 10 mile radius of Tufts MC is expected to grow by about 11% over the next 5 years. The Philips team identified the top five MRI exams required in the market area which represented 90% of all exams. The team also analyzed the services requested by the top referring physicians in order to better understand what MRI services are delivered to the top referrers.

The goals of this phase of the project were to recognize community and referral needs, determine ways to reduce referral leakage, and determine growth opportunities by identifying and developing potential differentiated MRI services, such as same-day service and newest digital MR technology. Tufts MC is situated in a very densely populated area with many hospitals providing quality patient care. Thus, Tufts MC must continue to deliver the best possible MRI services to remain competitive and gain market share.
Conclusion

Using a collaborative and end-to-end approach, the Philips consultants identified various performance improvement opportunities that will help Tufts MC create a more efficient workflow and enhance the patient, staff, and physician experience. The Tufts MC MRI Services team will continue to streamline their workflow by implementing the project change recommendations. Working collaboratively, the project team prioritized the improvement change initiatives according to the relative value of each recommendation and the level of effort required to implement each change program (See Figure 8). A high-level implementation plan with timeline was agreed.

The Tufts MC radiology leadership team was pleased with the project process and results. As the change recommendations are implemented, they will be measured and tracked on a continuous basis to document progress.

Figure 7: Example of Implementation Impact vs. Effort.
About the authors

Mel Allen, MBA has over 25 years’ experience in healthcare management with expertise in radiology, oncology, cardiology, and hospital performance improvement with clinical backgrounds and certifications in various areas of radiologic technology and radiology administration as well as business and health law degrees. Mel is a consulting director and can be reached at mel.allen@philips.com

Dr. Amrita Bhortake, MD, MS is a physician with expertise in family medicine and has consulting experience in healthcare management, performance improvement, and EMR implementations in radiology and emergency medicine. Amrita is a senior consultant with focus in clinical and business process improvement and can be reached at amrita.bhortake@philips.com

Dr. William A. Mehan, Jr., MD, MBA is a neuroradiologist at Tufts Medical Center and assistant professor of radiology for Tufts University School of Medicine in Boston, MA. He is an active physician with expertise in neuroradiology and general radiology. He received his MD from McGill University, Quebec, trained for residency at Rhode Island Hospital – Brown University Alpert Medical School and completed his neuroradiology fellowship at the Massachusetts General Hospital. He can be reached at wmehan@tuftsmedicalcenter.org

Doug Ranahan has 15 years of experience providing analytical guidance for strategic planning, revenue cycle management, physician performance improvement, payer negotiations, and contracting. He leverages advanced data analytic and visualization tools to help organizations make data-driven decisions and can be reached at douglas.ranahan@philips.com

Jillann Walker has healthcare experience in process development, performance improvement and patient safety consulting as well as clinical critical care nursing practice experience with registered nursing certification. Jillann is a consultant responsible for the delivery of strategic clinical and business performance improvement initiatives and can be reached at jillann.walker@philips.com

Paul Weintraub, MBA has healthcare industry and consulting experience spanning performance improvement, supply chain strategy and execution, technology utilization, systems implementation, and more. Paul is a consulting principal responsible for the development of standardized services, methodologies, and enabling tools and can be reached at paul.weintraub@philips.com

References


Learn more
Through transformative, end-to-end engagements, Philips Healthcare Transformation Services can help you unlock opportunities to solve your complex, intertwined challenges of care delivery. We can help you achieve meaningful and sustainable improvements in clinical excellence, operational efficiency, patient safety, and financial performance to improve value to your patients. For more information, please visit www.philips.com/healthcareconsulting